

Plague (*Yersinia pestis*)

(Also known as Pestis)

Report Immediately

August 2004 Updated (pages 1 and 5)

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Plague is a zoonotic disease of rodents and their fleas caused by the bacterium *Yersinia pestis*.

B. Clinical Description and Laboratory Diagnosis

The initial signs and symptoms of plague are usually nonspecific and include fever, chills, malaise, sore muscles (myalgia), nausea, sore throat, headaches, and weakness. Bubonic plague, the most common form of the disease, is a syndrome that includes painful swelling of lymph nodes (regional lymphadenitis). Pneumonic plague is a form of the illness resulting from hematogenous spread in bubonic or septicemic cases (secondary pneumonic plague) or inhalation of infectious droplets (primary pneumonic plague). Septicemic plague is a form caused by disseminated infection of the blood stream. Pneumonic plague refers to a form of the illness affecting the lungs. Meningeal plague, or plague affecting the membranes lining the brain and spinal cord, is rare. Both pneumonic and septicemic plague can be primary or they can be secondary from another form of plague. Untreated bubonic plague is fatal in 50–60% of cases, while untreated primary septicemic and pneumonic plague are fatal in 100% of cases.

Laboratory diagnosis is based on culture and identification of the organism from exudate aspirated from diseased lymph nodes, blood, CSF or sputum. The serologic methods are based on passive hemagglutination test (PHA). Also the fluorescent antibody (FA) test or enzyme linked immunosorbent assay (ELISA) is used for direct examination of clinical specimens.

C. Reservoirs

Certain wild rodents and their fleas carry *Y. pestis*. In the United States, ground squirrels and prairie dogs are the primary reservoirs of *Y. pestis*. Lagomorphs (rabbits and hares), wild carnivores (meat-eating mammals) and domestic cats may also be a source of infection to people.

D. Modes of Transmission

Plague is acquired naturally through the bite of an infected flea or through inhalation of airborne *Y. pestis*, either through proximity to a human or animal case of pneumonic plague or by accidental exposure in a laboratory. Plague can also be acquired by handling tissues of infected animals or by being bitten or scratched by an infected animal. Plague is considered a potential bioterroristic agent (See section H).

E. Incubation Period

The incubation period is from 1 to 7 days and usually 1 to 4 days for primary pneumonia.

F. Period of Communicability or Infectious Period

Patients with pneumonic plague are considered infectious throughout their symptomatic illness and for 48 hours following initiation of antibiotic treatment. Discharge from lesions in patients with bubonic plague is considered infectious.

G. Epidemiology

Wild rodent plague exists in large areas of South America, Africa, Eastern Europe and Asia. In 1994, an outbreak of pneumonic and bubonic plague occurred among people in Surat, India. In the United States, wild rodent plague occurs primarily in ground squirrels and prairie dogs in the western part of the country. Human cases in the western United States occur sporadically, usually following exposure to wild rodents or their fleas. Approximately 10 people are diagnosed with plague each year in the United States. Between 1977 and 1994, 17 people in the United States acquired plague from pet cats with pneumonic plague. No person-to-person transmission has been documented in the United States since 1925.

H. Bioterrorist Potential

Y. pestis is considered a potential bioterrorist agent. If effectively disseminated, *Y. pestis* could cause a serious public health challenge in terms of the public health system's ability to limit casualties and control other repercussions. *Y. pestis* is distributed worldwide. Techniques for mass production and aerosol dissemination are available, and the case fatality ratio of primary pneumonic plague is high with real potential for secondary spread. For these reasons, a biological attack with plague is considered to be a serious public health concern. A few sporadic cases will likely be missed or at least not attributed to a deliberate bioterrorist act. Any suspect case of plague should be reported immediately by telephone to the local health department. The sudden appearance of many patients presenting with fever, cough, a fulminant course and high case-fatality ratio should provide a suspect alert for anthrax or plague; if in addition cough is accompanied by hemoptysis, this presentation favors the tentative diagnosis of pneumonic plague.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. New Jersey Department of Health and Senior Services (NJDHSS) Case Definition

CASE CLASSIFICATION

A. CONFIRMED

A clinically compatible case **AND**:

- Isolation of *Yersinia pestis* from a clinical specimen, **OR**
- Fourfold or greater change in serum antibody titer to *Y. pestis* F1 antigen.

B. PROBABLE

A clinically compatible case **AND**:

- Elevated serum antibody titer to *Y. pestis* F1 antigen (without fourfold or greater change) in a patient with no history of plague vaccination, **OR**
- Detection of F1 antigen in a clinical specimen by fluorescent antibody test.

C. POSSIBLE

A clinically compatible case without laboratory results.

Note: See Section 3 C below for information on how to report a case.

B. Laboratory Testing Services Available

The New Jersey Public Health and Environmental Laboratories (PHEL) provide services for testing clinical specimens for *Y. pestis*. Specimens or isolates can be sent to PHEL after preliminary consultation with the Bioterrorism Program at 609.588.7500. The mailing address is: New Jersey Department of Health and Senior

Services, Division of Public Health and Environmental Laboratories, Specimen Receiving and Records, P.O. Box 361, John Fitch Plaza, Trenton, NJ 08625-0361.

Call the PHEL at 609.292.8396 for specific microbiologic consultation before submitting samples. In certain circumstances, the NJDHSS PHEL may forward serology specimens to the Centers for Disease Control and Prevention (CDC).

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify potential sources of transmission in the United States (such as wild rodents or other animals).
- To identify sources of transmission and geographical areas of risk outside of the United States.
- To stop transmission from such sources.
- To identify cases and clusters of human illness that may be associated with a bioterrorist event.

B. Laboratory and Healthcare Provider Reporting Requirements

The NJDHSS requires that healthcare providers and laboratories report any suspect or known case of plague to the local health officer in the community where diagnosed (preferably by telephone with follow up documentation via confidential fax or in writing, or filed electronically over the Internet using the confidential and secure Communicable Disease Reporting System).

NOTE: NJDHSS requires that cases, or potential exposure that might be bioterrorist in nature, be **immediately reported** to the local health officer where the patient is diagnosed. If this is not possible, call the NJDHSS Infectious and Zoonotic Diseases Program at 609.588.7500 (weekdays) or 609.392.2020 (nights/weekends). A case of plague is defined by the reporting criteria in Section 2 A above.

C. Local Departments of Health Responsibilities

1. Reporting Requirements

The NJDHSS requires that each local health officer immediately report any suspect or known case of plague, as defined by the reporting criteria in Section 2 A to the NJDHSS Communicable Disease Service by phone.

2. Case Investigation

- a. **The most important step a local health officer can take if he/she learns of a suspect or confirmed case of plague, or a potential exposure that may be a bioterrorist event, is to immediately call the NJDHSS, any time of the day or night.** Daytime phone number of the Infectious and Zoonotic Disease Program, Bioterrorism Unit in the Communicable Disease Service is 609.588.7500. The phone number for nights and weekends is 609.392.2020.
- b. Case investigation of plague in New Jersey residents will be directed by the NJDHSS. If a bioterrorist event is suspected, the NJDHSS and other response authorities will work closely with the local health officer and provide instructions/information on how to proceed.
- c. Following immediate notification to the NJDHSS, the health officer may be asked to assist in investigating patients who live within their communities, including gathering the following:
 - 1) The patient's name, age, address, phone number, status (hospitalized, at home, deceased), and parent/guardian information, if applicable.
 - 2) The name and phone number of the hospital where the patient is or was hospitalized.
 - 3) The name and phone number of the patient's attending physician if hospitalized.
 - 4) The name and phone number of the infection control official at the hospital if hospitalized.
 - 5) If the patient was evaluated by a healthcare provider before hospitalization, or if the patient was evaluated at more than one hospital, include names and phone numbers as well.

- d. Following immediate notification of the NJDHSS, the local health officer will be asked to assist in completing a [CDS-1](#) form. Most of the information required on the form can be obtained from the healthcare provider or the medical record. The report can also be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting System (CDRS).
- e. Use the following guidelines to assist you in completing the form:
 - 1) Record “Plague” as the disease being reported. If possible, record the type of plague (*e.g.*, bubonic, pneumonic, septicemic, or meningeal plague, or a combination of these).
 - 2) Record the patient’s demographic information.
 - 3) Record the date of symptom onset, symptoms, date of diagnosis, hospitalization information (if applicable), and outcome of disease (*e.g.*, recovered, died).
 - 4) Exposure history: use the incubation period range for plague (1–7 days). Specifically, focus on the period beginning a minimum of 1 days prior to the symptoms onset date back to no more than 7 days before onset for the following exposures:
 - a) Travel history: determine the date(s) and geographic area(s) traveled to by the patient to identify where the patient may have become infected.
 - b) Activities: for bubonic plague, ask about activities (*e.g.*, hiking) that might have exposed a person to fleas.
 - c) Sick animals and/or laboratory work: for pneumonic plague, ask about exposures to sick animals or about laboratory work.
 - 5) Complete the travel section to indicate where plague was acquired. If unsure, check “Unknown.”
 - 6) Include any additional comments regarding the patient.

If CDRS is used to report, enter collected information regarding exposure history, travel, and any additional information into “Comments” section.

- 7) If there have been attempts to obtain patient information (*e.g.*, the patient or healthcare provider does not return calls or respond to a letter, or the patient refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as possible. Please note on the form the reason why it could not be filled out completely.

After completing the form, it should be faxed with laboratory reports to the NJDHSS Infectious and Zoonotic Diseases Program, fax number is 609.631.4863. The report can be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting System (CDRS). Call the IZDP to confirm receipt of your fax or electronic report.

- f. Institution of disease control measures is an integral part of case investigation. In consultation with NJDHSS, it is the local health officer responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4, “Controlling Further Spread.”

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (N.J.A.C. 8:57-1.10)

Minimum Period of Isolation of Patient

Droplet precautions are indicated for patients with plague until pneumonia is excluded and appropriate antibiotic therapy has been initiated. In patients with pneumonic plague, droplet precautions should be

maintained for **48 hours** after starting antibiotic therapy. For patients with bubonic plague, standard precautions are advised.

Minimum Period of Quarantine of Contacts

See Section 4B, Protection of Contacts, below.

B. Protection of Contacts of a Case

- Cases with **pneumonic plague** are considered infectious throughout their symptomatic illness and for **48 hours** following initiation of antibiotic treatment. Any persons who have been in household or face-to-face contact with a case with pneumonic plague during the infectious period should be referred to their healthcare provider for antibiotic prophylaxis and be under surveillance for symptoms for 7 days. If a contact of a pneumonic plague case is unable to receive antibiotic prophylaxis, he/she should be placed under a strict quarantine for a 7-day period.
- **Bubonic plague** is generally not transmitted person-to-person.

C. Managing Special Situations

Reported Incidence Is Higher than Usual/Outbreak Suspected

If multiple cases of plague occur in individuals in city/town, or if an outbreak is suspected **contact the NJDHSS Infectious and Zoonotic Diseases Program at 609.588.7500 as soon possible**; investigate to determine the source of infection and mode of transmission (*e.g.*, contact with diseased rodents). Cases of plague in New Jersey are most commonly associated with travel to the western part of the United States or another country where the plague is endemic. The Program staff can help determine a course of action to prevent further cases and can perform surveillance for cases that cross several jurisdictions and therefore be difficult to identify at a local level.

Note: If a bioterrorist event is suspected, the NJDHSS and other response authorities will work closely with local health officers and provide instructions/information on how to proceed.

D. Preventive Measures

Personal Preventive Measures/Education

To avoid cases of plague, people should reduce the likelihood of being bitten by infected fleas or being exposed to patients with pneumonic plague by:

- Understanding the modes of transmission of plague and heeding any plague advisories while visiting the southwest United States.
- Preventing rodent access to food and shelter by ensuring appropriate storage and disposal of food, garbage and refuse.
- Using insect repellents while camping in rural plague-infected areas and reporting dead or sick animals to park rangers or public health authorities.
- Preventing flea infestations of their dogs and cats.
- Avoiding unnecessary contact with rodents or lagomorphs and using protective gloves if handling is necessary.

Additionally, for persons whose occupations put them at high risk for exposure to *Y. pestis* or plague-infected rodents, a *Y. pestis* vaccine is recommended. Also, vaccine may be considered for persons traveling to or residing in areas with epizootic or epidemic plague.

National and International Travel

- For more information regarding national/international travel and plague, contact the CDC's Traveler's Health Office at 877.394.8747 or through the Internet at <http://www.cdc.gov/travel/>

ADDITIONAL INFORMATION

A *Plague Fact Sheet* can be obtained at the NJDHSS www.state.nj.us/health/cd.

The CDC surveillance case definition for plague is the same as the criteria outlined in Section 2A of this chapter. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. For reporting to the NJDHSS, always refer to the criteria in Section 2A.

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